AMERICAN MUSEUM
Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, NY 10024
Number 3603, 7 pp., 1 figure April 9, 2008

The Cretaceous Scelionid Genus *Proteroscelio* Brues (Hymenoptera: Platygastroidea)

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ABSTRACT

The genus *Proteroscelio* Brues is redescribed and *P. gravatus*, n. sp., is described from Lebanese amber (Aptian age, 112–122 mya). The relationships between *Proteroscelio* and other scelionids is discussed. The described species of fossil platygastroids are tabulated. The taxa represented by the unavailable names *''Eopteromalites fushunensis''* Hong, *''Leptogasterites brunneus''* Hong, *''L. furvus''* Hong, and *''Sinilongicapito guchengziensis''* Hong, recently described from Fushun, Liaoning, China (50 mya), should all be classified as scelionids. The replacement name *Sinoprotelenomus* Zhang n. name is proposed for *Protelenomus* Zhang, 1989 (preoccupied by *Protelenomus* Kieffer, 1906).

INTRODUCTION

Despite a paucity of described species, the parasitoid wasp superfamily Platygastroidea (Scelionidae and Platygastridae) is cited as one of the dominant groups of Hymenoptera found in Cretaceous fossils (Grimaldi et al., 2002; Zherikhin and Sukacheva, 1971). Only five species from that time have been named to date (Carpenter et al., 1937; Nel and Azar, 2005; Schlüter, 1978), and most described fossil platygastroids are from Baltic amber inclusions (see appendix). A clarification of the relationships of the superfamily with the other major monophyletic groups of Hymenoptera would contribute substantially to elucidation of the phylogeny of all of the suborder Apocrita (Austin et al., 2005). Therefore, understanding the diversity and characteristics of these earliest elements of

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Platygastroidea promises to be an important element in the goal of resolving hymenopteran relationships.

Charles T. Brues described the genus *Proteroscelio* from a single fossil from Cedar Lake, Manitoba (Carpenter et al., 1937). In his description he drew attention to the significance of the 14-merous antenna, a characteristic at that time unknown among extant species. Brues referred to an undescribed species in Baltic amber also with 14-merous antenna, a taxon he later described as the genus *Archaeoscelio* (Brues, 1940). Today, a third genus is known with this feature, *Nixonia* Masner, an extant group of 14 species from tropical Africa and Asia (Johnson and Masner, 2006).

We describe and illustrate below the type species of *Proteroscelio*, *P. antennalis* Brues, and also describe a new, similar, but significantly older species, *P. gravatus*, n. sp. This new species is from Lebanese amber of lower Aptian age (112–122 mya).

MATERIALS

The new species described below was originally recognized as a species of *Proteroscelio* by L. Masner. This work is based on specimens in the following collections:

MNHN	A. Nel: Laboratoire d'Entomologie, Muséum National d'Histoire Naturelle, Paris, France
ROMC	J. Waddington: Department of Palaeobiology, Royal Ontario Museum, Toronto, Canada

Abbreviations and terms used in text: **A1, A2, … A14**: antennomere 1, 2, … 14; **claval formula**: distribution of the large, multiporous basiconic sensilla on the underside of apical antennomeres of the female, with the segment interval specified followed by the number of sensilla per segment (Bin, 1981); **epomial carina**: the vertical portion of epomium on the pronotum; **pronotal humeral carina**: the horizontal portion of epomium on the pronotum; **S1, S2, … S6**: metasomal sterna 1, 2, … 6; **T1, T2, … T7**: metasomal tergum 1, 2, … 7. Morphological terminology follows Masner (1980) and Mikó et al. (2007). Dates for geological periods are from Grimaldi and Engel (2005).

PROTEROSCELIO BRUES

Proteroscelio Brues, in Carpenter et al., 1937: 39. Original description. Type: *Proteroscelio antennalis* Brues, by monotypy and original designation. Walker, 1934: pl. 1, fig. 2; Muesebeck and Walkley, 1956: 392, citation of type species; Carpenter, 1992: 471, diagnosis; Johnson, 1992: 467, catalog of species.

DESCRIPTION: Body length 1.1–1.7 mm, gracile, mesosoma dorsoventrally depressed, head anteroposteriorly compressed.

Head wider than long, strongly transverse when viewed dorsally; vertex rounded, hyperoccipital carina absent; occipital carina absent; lateral ocellus distinctly separated from inner orbit by distance greater than one ocellar diameter; compound eye large, apparently bare. frons flat, without frontal depression, median longitudinal carina absent; no interantennal prominence visible; submedian carina absent; orbital carina absent; lower frons without fanlike striae; width of interocular space very broad, distinctly greater than eye height; clypeal region, mouthparts not clearly visible; antenna 14-merous; radicle inserted apically into base of A1, more or less parallel to longitudinal axis of A1; apical antennomeres forming a clava, either laterally compressed or generally enlarged; claval formula at least A7–A14/1–2–2–2–2–2–2–1.

Mesosoma strongly depressed; pronotum in dorsal view campanulate, ecarinate; netrion present as a narrow fusiform sclerite, closed ventrally; anterior margin of mesoscutum meeting pronotum dorsally; mesoscutum semioval in outline; notauli absent; parapsidal lines not distinguishable; skaphion absent; transscutal articulation well developed; scutellum semicircular, unarmed, flattened; mesopleuron strongly inclined anteriorly; mesopleural depression broad, deep; mesopleural carina absent; details of sculpture of meso-, metapleural area obscured; legs elongate, slender; femora weakly incrassate; trochantellus present on all legs; outer surface of tibiae without visible spines; tibial spur formula 1–2–2, spurs on mid- and hind tibiae fine, short; tarsal formula 5–5–5; tarsomeres tapering in width apically, cylindrical; pretarsal claws simple; forewing extending nearly to apex of metasoma; R slightly, but distinctly bent at origin of basal vein, extending through basal 0.6 of length of forewing, without large

bristles; costal cell basad of confluence of R with margin slightly darkened, more densely setose, R at this point more lightly pigmented, perhaps representing a bulla; r–rs nearly perpendicular with costal margin; R_1 continuing short distance along costal margin to form postmarginal vein; hind wing with R tracheate throughout its length, complete, i.e., reaching hamuli and costal margin; no strong bristles on R; three hamuli present; length of posterior marginal cilia of hind wing about one half greatest width of wing.

Metasoma weakly to strongly depressed, distinctly longer than head and mesosoma combined; segments subequal in length, T2 slightly longest; seven terga and sterna visible externally; laterotergites slightly widened, sharply flexed over lateral margin of metasoma, no submarginal ridge visible on sterna; T1 with basal carinate margin; S1 with median longitudinal ridge, apparently not protruding anteriorly between hind coxae; anterior margin of S2 straight; felt fields on sterna lacking; cerci visible as fingerlike appendages; apex of gonoplac visible protruding from metasoma.

DIAGNOSIS: This genus is distinguished from others with 14-merous antennae, i.e., *Nixonia* and *Archaeoscelio*, by the strongly flattened head and mesosoma, and the seven visible terga and sterna in the metasoma, and the well-developed stigmal (r–rs) and postmarginal (R_1) veins.

COMMENTS: In view of the age of these fossil species, it is reasonable to ask whether *Proteroscelio* is, in fact, a member of the family Scelionidae. The superfamily Platygastroidea has been defined on the basis of two characters: the presence of basiconic gustatory sensilla on the apical antennomeres, and the hydrostatic ovipositor system (Austin et al., 2005). The latter system cannot be observed in the fossil material, but the sensilla are clearly visible on the antennae of both species. These structures seem to be unique to the Platygastroidea. Within the superfamily, the family Platygastridae is defined by a series of reductional character states, none of which are found in *Proteroscelio*. Scelionidae have no defining synapomorphies and the family is probably paraphyletic, i.e., it is synonymous with the concept of the superfamily minus the Platygastridae. Thus, by default, *Proteroscelio* falls within the family Scelionidae. At least on the basis of the limited available material and our current understanding of the phylogeny of platygastroids, we see no compelling reason to propose any new family-group taxa.

KEY TO SPECIES OF *PROTEROSCELIO*

1. A3–A5 very short, wider than long; segments of antennal clava massive, cylindrical; lower portion of frons strongly reflexed *P. gravatus*, n. sp.
– A3–A5 elongate, longer than wide; segments of antennal clava strongly compressed laterally; lower portion of frons in same plane as upper frons *P. antennalis*

PROTEROSCELIO ANTENNALIS BRUES

Figures 1–2

Proteroscelio antennalis Brues, in Carpenter et al., 1937: 40. Original description.

DIAGNOSIS: Length: 1.7 mm. Distinguished from *P. gravatus,* n. sp., by the elongate funicular segments, the laterally compressed, serrate clavomeres, and the flat face.

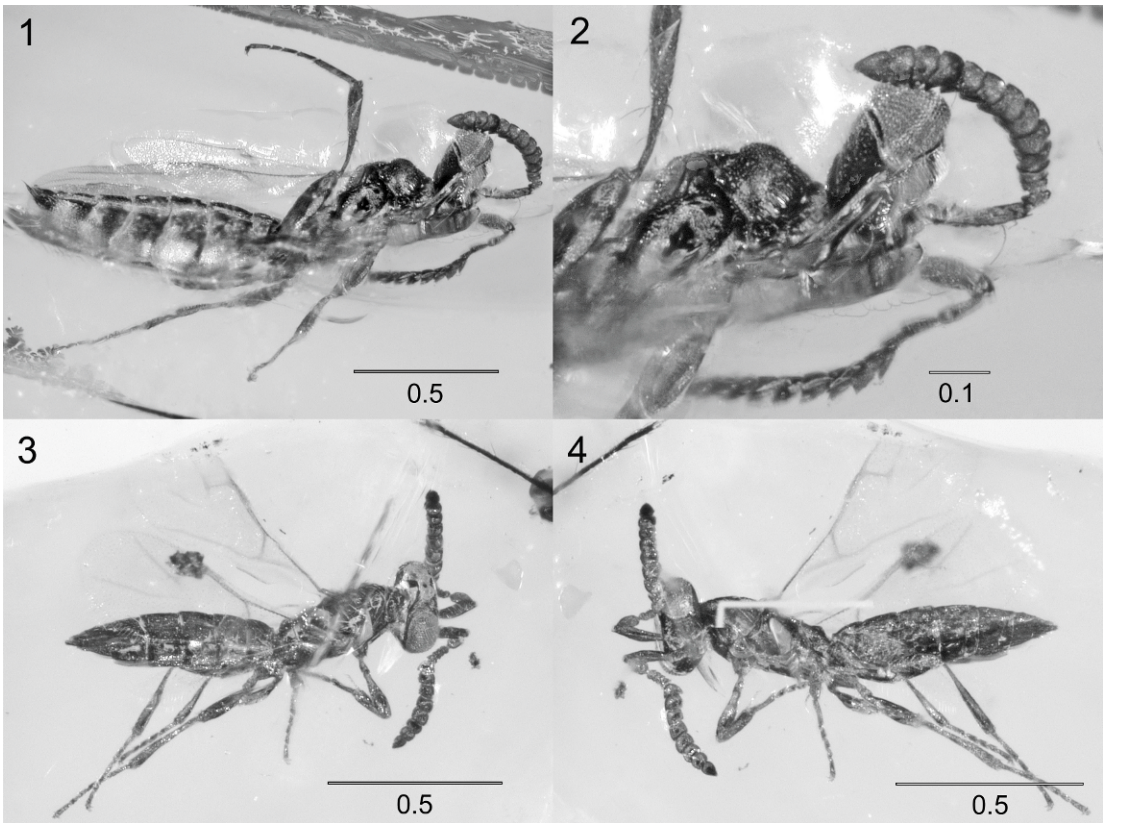
MATERIAL EXAMINED: Holotype female: "TYPE, *Proteroscelio antennalis* 'Brues', No. 56" (on underside). "*Proteroscelio antennalis* Brues, 56, Type." "56." Single block of amber attached to a microscope slide. Deposited in ROMC.

COMMENTS: The left antenna is deformed, laterally compressed, and, as a result, quite different in shape from the right. The apical 10 segments of both antennae are expanded to form a clava. The metasoma is somewhat inflated and, therefore, the laterotergites are opened and not tightly flexed against the sterna.

PROTEROSCELIO GRAVATUS NEW SPECIES

Figures 3–4

DESCRIPTION: The characters cited in the generic description may be supplemented as follows. Length 1.1 mm. Head with lower portion of frons, just above antennal insertions, strongly reflexed; A3–A6 short, strongly transverse, distinctly narrower than A2 or A7;



Figs. 1–2. *Proteroscelio antennalis* Brues, holotype female. **1,** Ventrolateral habitus. **2,** Head and mesosoma, ventrolateral view. Figs. 3–4. *Proteroscelio gravatus*, n. sp. **3**, Dorsolateral habitus. **4**, Ventrolateral habitus. Scale bars in millimeters.

A7–A13 cylindrical, evenly expanded; T3 longest metasomatic tergite, slightly longer than T2.

DIAGNOSIS: Distinguished from *P. antennalis* by the very short funicular segments.

MATERIAL EXAMINED: Holotype female: ''Ambre de HAMMANA/MDEIRIJ, LIBAN, Aptien inférieur, Collection Dany AZAR, Echantillon no 23.'' Single block of amber mounted beneath a cover slip on a microscope slide. Deposited in MNHN.

ETYMOLOGY: The epithet *gravatus* is from the Latin meaning ''weighed down'', referring to the massive antennal clava.

COMMENTS: The Aptian age, indicated on the specimen label, is defined in Grimaldi and Engel (2005) as extending from 112–122 mya. In the same text, the age of Lebanese amber is said to be between 120–135 mya. Nel and Azar (2005) cite the age of *Cretaxenomerus*, collected at the same Hammana locality, to be from 125–135 mya.

DISCUSSION

In the original description, Brues (in Carpenter et al., 1937) remarked that *Proteroscelio* ''resembles the remarkable Austromalayan genus *Platyscelio* somewhat in the form of the antennae in the less strongly flattened head and thorax, but it [*Proteroscelio*] is much less highly modified.'' The direct comparison of these two groups is superficial: the only real similarity lies in the flattened head and mesosoma.

For many years the consensus of opinion was that the most basal lineages of Scelionidae were the genera placed in the tribes Nixoniini

(*Nixonia*) and Sparasionini (*Sparasion* Latreille, *Sceliomorpha* Ashmead, *Archaeoteleia* Masner, *Electroteleia* Brues) (e.g., Masner, 1976; Kozlov and Kononova 1983). Recent works (e.g., Austin and Field, 1997; Johnson and Masner, 2006; Masner et al., 2007) challenge this notion: Scelionidae may be paraphyletic because *Sparasion* and *Sceliomorpha* may be most closely related to Platygastridae; *Archaeoteleia* possesses a tubular *Scelio*-type ovipositor and apparently is not closely related to other sparasionines; and an additional genus—*Neuroscelio* Dodd—must also be considered when addressing this question.

Proteroscelio generally has been considered to be a "primitive" scelionid, most likely because of the age of the fossil and the 14-merous antennae. It also has the 1–2–2 tibial spur formula, but the paired spurs on the mid and hind legs are fine and short, much more delicate than the robust structures in living genera. The metasoma is more or less evenly segmented, unlike most scelionids in which one segment—usually the second or third—is significantly longer than any other. *Proteroscelio* does have a fine but clearly developed malar sulcus, lacks the epomial and transverse carinae on the pronotum, lacks a clear bulla in the submarginal vein, and has the apex of the radicle inserted into the base of the scape more or less parallel to the long axis of the scape. It seems that the most appropriate interpretation is that *Proteroscelio* represents an ancient, but already highly specialized lineage.

A summary of the known fossil taxa of Platygastroidea is presented in the appendix. Few of these have been either critically or even recently examined, and their placement in this superfamily may well be subject to change. The names *"Eopteromalites"* Hong, *"Leptogasterites"* Hong, and *"Sinilongicapito"* Hong were originally described in the Chalcidoidea (Hong, 2002). They are actually members of the Scelionidae; this judgment is based upon the line drawings and photographs of the original amber specimens. However, these names are not available under the International Code of Zoological Nomenclature because the author did not specify a depository for the type specimens. He only generally stated in the preface that "most" specimens are deposited in the Geological Museum of China.

ACKNOWLEDGMENTS

We thank J.-Y. Rasplus (Montpelier, France) and J. Heraty (Riverside, CA) for making available for study the specimen in Lebanese amber; to J.S. Noyes (London, UK) for alerting us to Hong (2002); and to Zhang Junfeng (Nanjing) for the contribution of the name *Sinoprotelenomus*. This material is based upon work supported in part by the National Science Foundation under grants No. DEB–0344034 and DEB–0614764.

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APPENDIX 1

Described species of fossil and subfossil Platygastroidea

Dates for geological periods are from Grimaldi and Engel (2005).

Cretaceous Period

Aptian Age (Lebanese amber: 112–122 mya)
Cretoxenomerus jankotejai Nel and Azar, 2005
Proteroscelio gravatus, n. sp.

Cenomanian Age (unnamed formation: 100 mya)
Cenomanoscelio pulcher Schlüter, 1978

Campanian Age (Cedar Lake, Canada: 80 mya)
Baeomorpha dubitata Brues, 1937
Baryconus fulleri Brues, 1937
Proteroscelio antennalis Brues, 1937

Tertiary Period

Paleocene to Middle Eocene (Bílé Karpaty, Belověž Formation, Czech Republic (<65 mya)
Moravoscelio bednariki Nel and Prokop, 2005

Lower Eocene Epoch (Les Quesnoy, France: 55.6 mya)
Galloscelio pumilio Nel and Prokop, 2005

Eocene Epoch (Fushun, Liaoning, China: 50 mya)
''Eopteromalites fushunensis'' Hong, 2002
''Leptogasterites brunneus'' Hong, 2002
''Leptogasterites furvus'' Hong, 2002
''Sinilongicapito guchengziensis'' Hong, 2002

Middle Eocene Epoch (Baltic amber: 44 mya)
Aneurobaeus collaris Brues, 1940
Archaeoscelio filicornis Brues, 1940
Archaeoscelio rugosus Brues, 1940
Brachyscelio cephalotes Brues, 1940
Brachyscelio dubius Brues, 1940
Ceratobaeoides acuminatus Brues, 1940
Ceratoteleia caudata Brues, 1940
Ceratoteleia proleptica Brues, 1940
Ceratoteleia succinophila Brues, 1940
Chromoteleia theobaldi Maneval, 1938
Cobaloscelio cuspidatus Johnson and Masner, 2007
Cobaloscelio speculifer Johnson and Masner, 2007
Dissolcus electra Brues, 1940
Electroteleia stigmatica Brues, 1940
Hadronotoides dubitatus Brues, 1940
Hadronotus electrinus Cockerell, 1909
Hoploteleia doddii Brues, 1940
Idris ilonkae Szabó and Oehlke, 1986
Macroteleia renatae Szabó and Oehlke, 1986
Mirotelenomus angulatus Brues, 1940
Parabaeus pusillus Brues, 1940
Proplatyscelio depressus Brues, 1940
Pseudobaeus fecundulus Brues, 1940
Sembilanocera clavata Brues, 1940
Sparaison amabilis Brues, 1940
Sparaison simplicifrons Brues, 1940
Trachelopteron angulipenne Brues, 1940
Uroteleia synthetica Brues, 1940

Late Eocene Epoch (Florissant: 38 mya)
Palaeoteleia oxyura Cockerell, 1915

Eocene-Oligocene boundary (Isle of Wight: 38 mya)
Macroteleia veterna Cockerell, 1921

Late Oligocene Epoch (Chiapas amber: 23–28 mya)
Palaeogryon muesebecki Masner, 1969

Oligocene or Miocene Epoch (Rott: 20–28 mya)
Platygasterites femoralis Statz, 1938
Platygasterites spinosa Statz, 1938
Scelionites capitatus Statz, 1938

Middle Miocene Epoch (~18 mya)

Sinoprotelenomus miocenicus (Zhang,) **new combination**. *Sinoprotelenomus* **new name** is proposed by Dr. Zhang Junfeng for *Protelenomus* Zhang, 1989, preoccupied by *Protelenomus* Kieffer, 1906

Subfossil copal
Acutibaeus bellicosus Meunier, 1917
Calotelea aurantia Hope, 1837
Ceratobaeus incertus Meunier, 1905

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